CLAIMS

1. A method of forming a copper wiring line, comprising processes of:

applying a resist layer to a base layer of a workpiece;

patterning said resist layer to form a recessed region and an adjacent field region in said resist layer;

then depositing a metal seed layer on said workpiece, including in said recessed region and on said field region;

then causing a plating accelerator to become attached to said metal seed layer selectively in said recessed region, with relatively little or no accelerator attached to said metal seed layer in said field region, thereby forming an acceleration region in said recessed region; and

then plating copper on said workpiece, wherein said accelerator selectively attached in said acceleration region increases a rate of copper plating in said acceleration region relative to a rate of copper plating in said field region.

2. A method as in claim 1, further comprising processes of:

continuing plating copper until an accelerated thickness of plated copper in said acceleration region is at least 3 μm thicker than a field thickness of copper in said field region.

3. A method as in claim 1, further comprising processes of:

removing copper from said field region after said processes of plating copper.

4. A method as in claim 3 wherein said processes of removing copper from said field region form a wiring line having a wire width at least two times greater than a wire thickness.

5. A method as in claim 3 wherein said processes of removing copper from said field region comprise:

conducting a wet etch to remove copper from said field region.

6. A method as in claim 3, further comprising processes of:

removing said resist layer from said field region after said processes of removing copper from said field region.

7. A method as in claim 1, wherein causing an accelerator to become

attached to said metal seed layer selectively in said recessed region comprises processes of:

applying an accelerator film on said metal seed layer; and

then selectively removing at least a portion of said accelerator film from said metal seed layer in said field region.

8. A method as in claim 7, wherein:

said applying an accelerator film is conducted using an accelerator solution; and

said plating copper is conducted using a plating solution, wherein said accelerator solution comprises a greater concentration of said accelerator than said plating solution.

9. A method as in claim 8, wherein:

said plating solution comprises an accelerator concentration of substantially zero.

10. A method as in claim 8, wherein:

said accelerator solution comprises accelerator molecules selected from the group consisting of 2-mercaptoethane sulfonic acid (MESA), 3-mercapto-1-propane sulfonic acid (MPSA), 3-mercaptopropionic acid, mercaptopyruvate, 3-mercapto-2-butanol, 1-thioglycerol, dimercaptopropane sulfonic acid (DMPSA), dimercaptoethane sulfonic acid (DMESA), and salts thereof.

11. A method as in claim 8, wherein said applying an accelerator film comprises:

contacting said metal seed layer with said accelerator solution.

12. A method as in claim 7, wherein said selectively removing at least a portion of said accelerator film comprises:

contacting said workpiece surface with a pad that selectively removes said accelerator film from said field region.

13. A method as in claim 12, wherein contacting said workpiece surface with said pad is performed for a period of time and then stopped prior to said plating copper.

14. A method as in claim 12, wherein contacting said workpiece surface with

said pad is not performed during at least a portion of said processes of plating copper.

15. A method as in claim 7, further comprising:

removing said accelerator from said field region at least once after said processes of plating copper have commenced.

16. A method as in claim 15, further comprising:

applying said accelerator to said workpiece surface during said processes of plating copper.

17. A method of forming a metal structure in an electronic device, comprising processes of:

providing a workpiece having a surface with a recessed region and an adjacent field region;

then causing an accelerator to become attached to said workpiece surface selectively in said recessed region, thereby forming an acceleration region in said recessed region, with relatively little or no accelerator attached to said workpiece surface in said field region;

then depositing metal on said workpiece, wherein said accelerator attached in said acceleration region increases a rate of metal deposition in said acceleration region relative to a rate of metal deposition in said field region.

18. A method as in claim 17, further comprising processes of:

continuing depositing metal until an accelerated thickness of deposited metal in said acceleration region is at least 3 μm thicker than a field thickness of metal in said field region.

19. A method as in claim 17, further comprising processes of:

removing metal from said field region after said processes of depositing metal.

20. A method as in claim 19 wherein said processes of removing metal from said field region form a metal structure having a structure width at least two times greater than a structure thickness.

21. A method as in claim 19 wherein said processes of removing metal from said field region comprise:

conducting a wet etch to remove metal from said field region.

22. A method as in claim 17 wherein causing an accelerator to become attached to said workpiece surface selectively in said recessed region comprises processes of:

applying an accelerator film on said workpiece surface; and

then selectively removing at least a portion of said accelerator film from said workpiece surface in said field region.

23. A method as in claim 22, wherein:

said applying an accelerator film is conducted using an accelerator solution; and

then said depositing metal is conducted using a plating solution, wherein said accelerator solution comprises a greater concentration of said accelerator than said plating solution.

24. A method as in claim 23, wherein:

said accelerator solution comprises accelerator molecules selected from the group consisting of 2-mercaptoethane sulfonic acid (MESA), 3-mercapto-1-propane sulfonic acid (MPSA), mercaptopyruvate, 3-mercapto-2-butanol, 1-thioglycerol, dimercaptopropane sulfonic acid (DMPSA), dimercaptoethane sulfonic acid (DMESA), and salts thereof.

25. A method as in claim 17 wherein said workpiece comprises a base layer, and further comprising processes of:

applying a resist layer to said base layer; and

then patterning said resist layer to form said recessed region and said field region.

26. A method as in claim 17, further comprising processes of:

depositing a metal seed layer on said workpiece, including in said recessed region and in said field region, before said processes of causing an accelerator to become attached.

27. A method as in claim 17, further comprising processes of:

applying a resist layer to a base layer of said workpiece;

then patterning said resist layer to form said recessed region and said field

region;

removing metal from said field region after said processes of depositing metal; and

then removing said resist layer from said field region after said processes of removing metal from said field region.

28. A method as in claim 17 wherein said processes of depositing metal comprise depositing copper.

29. A method of using a plating accelerator for plating metal on a workpiece, comprising processes of:

globally applying an accelerator to a workpiece to form a global accelerator film on said workpiece;

selectively removing a portion of said accelerator film from said workpiece to form an acceleration region and a non-activated region on said workpiece, said acceleration region comprising accelerator at a higher concentration than in said non-activated region; and

then using a plating technique to deposit metal on said workpiece, wherein said accelerator at higher concentration in said acceleration region increases a rate of metal plating in said acceleration region relative to a rate of metal plating in said non-activated region.

30. A method as in claim 29 wherein said processes of applying an accelerator comprise applying a liquid accelerator solution.

31. A method as in claim 30 further comprising processes of:

after said applying said liquid accelerator solution, removing liquid accelerator solution from said workpiece without substantially removing said accelerator film from said workpiece.

32. A method as in claim 31 wherein said processes of removing liquid accelerator solution from said workpiece comprise rinsing said workpiece with liquid solvent, said liquid solvent having a lower concentration of accelerator than a concentration of accelerator in said liquid accelerator solution.

33. A method as in claim 31 wherein said processes of removing liquid accelerator solution from said workpiece comprise drying said workpiece.

34. A method as in claim 29 wherein said processes of applying said accelerator comprise applying said accelerator to a metallic layer on said workpiece.

35. A method as in claim 29 wherein said processes of using a plating technique to deposit metal on said workpiece comprise continuing plating metal to a desired thickness of metal in said acceleration region, and wherein during continued metal plating, said accelerator in said acceleration region continues to cause a faster rate of metal plating in said acceleration region relative to a rate of metal plating in said non-activated region.

36. A method as in claim 29 wherein said processes of applying said accelerator comprise applying accelerator molecules.

37. A method as in claim 36 wherein said applying accelerator molecules comprises applying a liquid accelerator solution comprising said accelerator molecules.

38. A method as in claim 36 wherein said applying accelerator molecules comprises applying accelerator molecules selected from the group consisting of 2-mercaptoethane sulfonic acid (MESA), 3-mercapto-1-propane sulfonic acid (MPSA), mercaptopyruvate, 3-mercapto-2-butanol, 1-thioglycerol, dimercaptopropane sulfonic acid (DMPSA), dimercaptoethane sulfonic acid (DMESA), and salts thereof.